

## 8. REGULATIONS AND ADVISORIES

Zinc (fume and dust) and its compounds are on the list of chemicals appearing in "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986" (EPA 1991d).

The national and state regulations and guidelines pertaining to zinc and compounds in air, water, and food are summarized in Table 8-1. No international regulations or guidelines applicable to zinc or its compounds were found.

ATSDR has derived intermediate oral MRL for zinc based on decreased erythrocyte superoxide dismutase, a sensitive indicator of body copper status, in women given supplements containing zinc gluconate for 10 weeks (Yadrick et al. 1989). The intermediate oral MRL has been adopted as the chronic oral MRL.

EPA has derived oral reference doses (RfDs) of 0.3 mg/kg/day for zinc (IRIS 2003). EPA has not derived an inhalation reference concentration (RfC) for zinc.

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**Table 8-1. Regulations and Guidelines Applicable to Zinc and Zinc Compounds**

| Agency                      | Description  | Information           | Reference                                    |
|-----------------------------|--|-----------------------|--|
| <u>INTERNATIONAL</u>        |  |                       |  |
| Guidelines:                 |  |                       |  |
| IARC                        | Carcinogenicity classification                                       | No data               |  |
| WHO                         | Drinking water and air quality guidelines                            | No data               |  |
| <u>NATIONAL</u>             |  |                       |  |
| Regulations and Guidelines: |  |                       |  |
| a. Air                      |  |                       |  |
| ACGIH                       | TLV (8-hour TWA)   | No data               |  |
| EPA                         | Hazardous air pollutant pursuant to Section 112 of the Clean Air Act | Zinc<br>Zinc oxide    | EPA 2003e<br>40 CFR 61.01                    |
| NIOSH                       | REL (10-hour TWA)  |                       | NIOSH<br>2003a,2003b                         |
|                             | Zinc chloride (fume)   | 1 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (dust and fume)   | 5 mg/m <sup>3</sup>   |  |
|                             | STEL (15-minute TWA)   |                       |  |
|                             | Zinc chloride (fume)   | 2 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (fume)  | 10 mg/m <sup>3</sup>  |  |
|                             | Ceiling  |                       |  |
|                             | Zinc oxide (dust)  | 15 mg/m <sup>3</sup>  |  |
|                             | IDLH   |                       |  |
|                             | Zinc chloride (fume)   | 50 mg/m <sup>3</sup>  |  |
|                             | Zinc oxide   | 500 mg/m <sup>3</sup> |  |
| OSHA                        | PEL (8-hour TWA) for general industry                                |                       | OSHA 2003a<br>29 CFR 1910.1000,<br>Table Z-1 |
|                             | Zinc chloride (fume)   | 1 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (fume and respirable fraction of dust)                    | 5 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (total dust)  | 15 mg/m <sup>3</sup>  |  |
|                             | PEL (8-hour TWA) for construction industry                           |                       | OSHA 2003c<br>29 CFR 1926.55,<br>Appendix A  |
|                             | Zinc chloride (fume)   | 1 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (fume and respirable fraction of dust)                    | 5 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (total dust)  | 15 mg/m <sup>3</sup>  |  |
|                             | PEL (8-hour TWA) for shipyard industry                               |                       | OSHA 2003b<br>29 CFR 1915.1000               |
|                             | Zinc chloride (fume)   | 1 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (fume and respirable fraction of dust)                    | 5 mg/m <sup>3</sup>   |  |
|                             | Zinc oxide (total dust)  | 15 mg/m <sup>3</sup>  |  |
| b. Water                    |  |                       |  |
| EPA                         | Drinking water health advisories                                     |                       | EPA 2002                                     |
|                             | 1-day (10-kg child)  |                       |  |
|                             | 10-day (10-kg child)   | 6 mg/L                |  |
|                             | DWEL <sup>a</sup>  | 6 mg/L                |  |
|                             | Lifetime <sup>b</sup>  | 10 mg/L               |  |
|                             |  | 2 mg/L                |  |

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| Agency                  | Description  | Information                   | Reference                        |
|-------------------------|--|-------------------------------|----------------------------------|
| <u>NATIONAL</u> (cont.) |  |                               |                                  |
| EPA                     | Hazardous substance in accordance with Section 311 (b)(2)(A) of the Clean Water Act  | Zinc chloride<br>Zinc sulfate | EPA 2003k<br>40 CFR 116.4        |
|                         | Hazardous substance in accordance with Section 311 of the Clean Water Act; reportable quantities   |                               | EPA 2003g<br>40 CFR 117.3        |
|                         | Zinc chloride  | 1,000 pounds                  |                                  |
|                         | Zinc sulfate   | 1,000 pounds                  |                                  |
|                         | National secondary drinking water regulations; secondary MCL for zinc  | 5 mg/L                        | EPA 2003f<br>40 CFR 143.3        |
|                         | Pollutants of initial focus in the Great Lakes Water Quality Initiative  | Zinc                          | EPA 2003l<br>40 CFR 132, Table 6 |
|                         | Reportable quantities of hazardous substances designated pursuant to Section 311 of the Clean Water Act                                  |                               |                                  |
|                         | Zinc chloride  | 1,000 pounds                  |                                  |
|                         | Zinc sulfate   | 1,000 pounds                  |                                  |
|                         | Toxic pollutant designation pursuant to Section 307(a)(1) of the Clean Water Act   | Zinc and compounds            | EPA 2003c<br>40 CFR 401.15       |
| c. Food                 |  |                               |                                  |
| EPA                     | Tolerances for residues (ppm) of a fungicide (mancozeb), which contains 20% manganese, 2.5% zinc, and 77.5% ethylene-bisdi-thiocarbamate |                               | EPA 2003j<br>40 CFR 180.176      |
|                         | Apple  | 7                             |                                  |
|                         | Asparagus  | 0.1                           |                                  |
|                         | Banana   | 4                             |                                  |
|                         | Banana, pulp (no peel)   | 0.5                           |                                  |
|                         | Barley, grain  | 5                             |                                  |
|                         | Barley, milled feed fractions  | 20                            |                                  |
|                         | Barley, straw  | 25                            |                                  |
|                         | Beet, sugar  | 2                             |                                  |
|                         | Beet, sugar tops   | 65                            |                                  |
|                         | Carrots  | 2                             |                                  |
|                         | Celery   | 5                             |                                  |
|                         | Corn, fodder and forage  | 5                             |                                  |
|                         | Corn, grain  | 0.1                           |                                  |
|                         | Cottonseed   | 0.5                           |                                  |
|                         | Crabapple  | 10                            |                                  |
|                         | Cranberry  | 7                             |                                  |
|                         | Cucumber   | 4                             |                                  |
|                         | Fennel   | 10                            |                                  |
|                         | Fresh Corn   | 0.5                           |                                  |

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|-------------------------|--|---|---------------------------------|
| <u>NATIONAL</u> (cont.) |  |   |                                 |
| EPA                     | Tolerances for residues (cont.)  |   | EPA 2003j                       |
|                         | Grape  | 7   | 40 CFR 180.176                  |
|                         | Kidney   | 0.5   |                                 |
|                         | Liver  | 0.5   |                                 |
|                         | Melon  | 4   |                                 |
|                         | Oat, bran and milled feed fractions  | 20  |                                 |
|                         | Oat, grain   | 5   |                                 |
|                         | Oat, straw   | 25  |                                 |
|                         | Onion, dry bulb  | 0.5   |                                 |
|                         | Papaya   | 10  |                                 |
|                         | Peanut   | 0.5   |                                 |
|                         | Peanut vine hay  | 65  |                                 |
|                         | Pear   | 10  |                                 |
|                         | Popcorn grain  | 0.5   |                                 |
|                         | Quince   | 10  |                                 |
|                         | Rye, grain   | 5   |                                 |
|                         | Rye, milled feed fractions   | 20  |                                 |
|                         | Rye, straw   | 25  |                                 |
|                         | Squash, summer   | 4   |                                 |
|                         | Tomato   | 4   |                                 |
|                         | Wheat, grain   | 5   |                                 |
|                         | Wheat, milled feed fractions   | 20  |                                 |
|                         | Wheat, straw   | 25  |                                 |
| FDA                     | Bottled drinking water (allowable concentration of zinc); mineral water is exempt based on aesthetically allowable levels and do not relate to health concern                | 5.0 mg/L                                    | FDA 2003a<br>21 CFR 165.110     |
|                         | Drug products containing certain active ingredients offered over-the-counter (OTC) for certain uses; ingredients used in skin protectant drug products                       | Zinc chloride<br>Zinc oxide<br>Zinc sulfate | FDA 2003c<br>21 CFR 310.545     |
|                         | Nutrition labeling of food; statement of the amount per serving of zinc calculated as a percent of the RDI and expressed as percent of Daily Value                           | 15 mg                                       | FDA 2003b<br>21 CFR 101.9(c)(8) |
|                         | Substances generally recognized as safe; trace minerals added to animal feeds as nutritional dietary supplements when added at levels consistent with good feeding practices | Zinc chloride<br>Zinc oxide<br>Zinc sulfate | FDA 2003d<br>21 CFR 582.80      |

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| Agency                  | Description   | Information  |  | Reference  |
|-------------------------|---|--|--|--|
| <u>NATIONAL</u> (cont.) |   |  |  |  |
| FDA                     | Zinc oxide and zinc sulfate are substances generally recognized as safe when used in accordance with good manufacturing practices |  |  | FDA 2003e<br>21 CFR 182.8991<br><br>FDA 2003e<br>21 CFR 182.8997 |
| d. Other                |   |  |  |  |
| EPA                     | Carcinogenicity classification  | D <sup>c</sup>                                     |  | IRIS 2003  |
|                         | RfD   | 3x10 <sup>-1</sup> mg/kg/day                       |  | IRIS 2003  |
|                         | Community right-to-know; release reporting; effective date of reporting for zinc (fume and dust)                                  | 01/01/87   |  | EPA 2003j<br>40 CFR 372.65                                       |
|                         | Designated as a hazardous substance pursuant to Section 311(b)(2) of the Clean Water Act; reportable quantity                     |  |  | EPA 2003b<br>40 CFR 302.4  |
|                         | Zinc and compounds  | Not assigned                                       |  |  |
|                         | Designated as a hazardous substance pursuant to Section 307(a) of the Clean Water Act; reportable quantities                      |  |  | EPA 2003b<br>40 CFR 302.4  |
|                         | Zinc chloride   | 1,000 pounds                                       |  |  |
|                         | Zinc sulfate  | 1,000 pounds                                       |  |  |
|                         | Hazardous constituent for municipal solid waste landfills   | Zinc   |  | EPA 2003a<br>40 CFR 258, Appendix II                             |
|                         | Land disposal restrictions; universal treatment standards for zinc  |  |  | EPA 2003d<br>40 CFR 268.48                                       |
|                         | Waste water standard  | 2.61 mg/L  |  |  |
|                         | Non-waste water standard  | 4.3 mg/L TCLP                                      |  |  |
|                         | Standards for owners and operators of hazardous waste TSD facilities; groundwater monitoring for zinc                             | Suggested<br><u>method</u><br>6010<br>7950<br>7951 | <u>PQL</u><br>20 µg/L<br>50 µg/L<br>0.5 µg/L | EPA 2003h<br>40 CFR 264, Appendix IX                             |
| <u>STATE</u>            |   |  |  |  |
| a. Air                  | No data   |  |  |  |
| b. Water                |   |  |  |  |
| Arizona                 | Drinking water guideline (zinc and zinc compounds)  | 5 mg/L   |  | HSDB 2003  |
| Illinois                | Drinking water standard (zinc and zinc compounds)   | 5 mg/L   |  | HSDB 2003  |
| Minnesota               | Drinking water guideline (zinc and zinc compounds)  | 2 mg/L   |  | HSDB 2003  |

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|----------------------|-------------|-------------|-----------|
| <u>STATE</u> (cont.) |             |             |           |
| c. Food              | No data     |             |           |
| d. Other             | No data     |             |           |

<sup>a</sup>DWEL: a lifetime exposure concentration protective of adverse, non-cancer health effects, that assumes all of the exposure to a contaminant is from drinking water.

<sup>b</sup>Lifetime: the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. The Lifetime HA is based on exposure of a 70-kg adult consuming 2 L water/day.

<sup>c</sup>D: not classifiable as to human carcinogenicity

ACGIH = American Conference of Governmental Industrial Hygienists; CFR = Code of Federal Regulations; DWEL = drinking water equivalent level; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; HA = health advisory; HSDB = Hazardous Substances Data Bank; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; IRIS = Integrated Risk Information System; MCL = maximum contaminant level; NIOSH = National Institute for Occupational Safety and Health; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; PQL = practical quantitation level; RDI = recommended daily intake; REL = recommended exposure limit; RfD = reference dose; STEL = short-term exposure limit; TCLP = toxicity characteristic leachate procedure; TLV = threshold limit values; TSD = treatment, storage, and disposal; TWA = time-weighted average; WHO = World Health Organization